REMARKS

In the Office Action, the Examiner rejected claims 1 – 8 as obvious over Kikushima in view of Mori, and rejected claim 9 as obvious over Kikushima and Mori in view of Perino.

Elected Invention

In the previous action, the Examiner identified the claims 1 – 9 as apparatus claims and claims 10 – 13 as method claims, and required election of either the apparatus or method. Applicant's response elected the apparatus claims as identified by the Examiner. Applicant notices that the claim 13 is an apparatus claim, rather than a method, and so Applicant requests examination of the apparatus claim 13 with the previously elected apparatus claims 1 – 9.

35 U.S.C. §103(a)

Kikushima discloses a piezoelectric oscillator having a resonator enclosed in a cylindrical case 51 and an IC chip 60 mounted to a lead frame 70. The lead frame is molded into a molding resin 1 with lead portions 72 of the lead frame extending from the resin to form J-shaped leads for the oscillator. The lead frame includes a radiating lead 11 exposed from the side surfaces of the package to conduct heat away from the IC chip 60. The radiating lead may have holes 13 at the edge of the molding resin to prevent cracking of the resin during molding of the radiating lead.

The **Mori et al.** reference discloses a resin sealed semiconductor device having a semiconductor element 2 with a resin film 12 to bond the element to a die pad 11. The die pad may be made of a copper alloy. A resin seals the lead frame to provide the sealed semiconductor device. The disclosure is directed to ensuring that the holes in the lead frame

do not become completely filed with resin by controlling the spacing of the openings and the modulus of elasticity of the resin film. The resin sealed device is prevented from cracking.

Thus, both Kikushima and Mori teach improvements in the lead frames found within the resin molded component. The person of ordinary skill in the art would only look to these reference, particular if considered in combination, to make improvements in the lead frame of a component. The person of ordinary skill would not find a teaching in these references, even if considered in combination, to provide a heat sink that has been attached to the component by inserting a perforate plate of the heat sink between the component and the circuit board on which the component is mounted.

The **Perino et al.** reference discloses a chip socket assembly defining a frame for connecting edge mountable chips to a circuit board. The Perino reference does not provide a teaching of a heat sink.

None of the cited references provide a heat sink. None of the references provide a mounting of a heat sink by placing a plate shaped portion between the electronic component and the mounting board. None of the references have a finned heat sink. None of the references show a clip shaped part to hold the heat sink onto the electronic component prior to mounting the component on the mounting board. One looking to solve the problems addressed by the present invention would not even look to the prior art cited here.

The present invention provides a heat sink for a heat producing electronic component that is mounted by a mounting plate extending between the electronic component and the mounting board. The heat sink extends upward from the mounting board along side the component and to a heat dissipating surface. The heat dissipating surface of preferred

embodiments are low profile fins, permitting the mounting board with the component and heat sink thereon to be mounted in tight spaces, yet effectively dissipate heat.

The structure of the present heat sink permits the assembly of the component and the heat sink onto the mounting board in a single step. A significant cost and time savings is realized by the structure claimed in the present claims.

Claim 1 is directed to a heat sink assembly, which is not shown in the cited art. Even though the Kikushima reference discloses wide leads extending from inside a chip, it is not a heat sink assembly as claimed. No reference teaches a mounting plate with adhesive flow openings mounted on a mounting pad on a circuit board.

The present invention as claimed is thus not shown or suggested in the prior art, and therefore is a non-obvious improvement thereover.

Additional Art

The additional art cited by the Examiner is noted.

Conclusion

Each issue raised in the action has been addressed. Early favorable reconsideration and allowance is hereby requested.

Respectfully submitted,

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to:

The Assistant Commissioner for Patents
Washington, D.C. 20231

on June 28, 2002.

VERSION MARKED TO SHOW CHANGES

The claims have been amended as follows:

1. (Amended) A heat sink assembly, comprising:

a circuit board having a mounting pad provided with an adhesive material in a mounting region;

a mounting plate formed of a thermally conductive material and defining a plurality of adhesive flow openings therethrough, said mounting plate having a first major surface being positioned on said mounting pad of said circuit board;

a heat dissipation element thermally connected to said mounting plate and being spaced from said circuit board, said heat dissipating element being disposed in a position to receive air flow on both sides; and

a heat generating component mounted on said mounting plate at a second major surface opposite said first major surface.

13. (Amended) A heat sink for a surface mounted heat generating component, comprising:

a mounting plate of a generally planer configuration defining a plurality of openings therethrough for adhesive flow through said openings;

an extension member extending generally perpendicular to said mounting plate;

a heat dissipation element connected to said extension member, said heat dissipation element and [,] said extension member surface and said mounting plate being thermally

conductive and said heat dissipating element being spaced from the heat generating component.